

SCIENCE

[Entered at the Post-Office of New York, N. Y., as Second-Class Matter.]

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

EIGHTH YEAR.
VOL. XV. No. 376.

NEW YORK, APRIL 18, 1890.

SINGLE COPIES, TEN CENTS.
\$3.50 PER YEAR, IN ADVANCE.

THE SUPPRESSION OF CONSUMPTION.

WE have in consumption to deal with a disease that causes upwards of 60,000 deaths every year in the United Kingdom; and it is estimated, on the basis of three invalids for each death, that about 200,000 persons suffer from it within that period. This disease pervades all ranks of society, from the mansion of the rich to the cottage of the poor, and it attacks in its course childhood, youth, maturity, and old age. Can we suppress consumption,—a disease that has so wide an area of distribution, and that possesses such a fatal character? I have come, after due and careful investigation of the subject, to the conclusion that we can. The issue here raised is of immense importance. It is a question of life or death for hundreds of thousands; and I earnestly request careful consideration of the evidence I shall adduce in support of the case, which, I say, not only completely justifies, but also necessitates, the conclusion that we now have it in our power to suppress consumption. And I would at once note the fact that there is no essential reason why that should not be accomplished. Man is not born to die from this disease, and, in fact, from four-fifths to six-sevenths of the race do not. We have unquestionable evidence that consumption has been completely recovered from, that a considerable reduction in its amount has been effected in some cases (for example, among prisoners), that it has been arrested for longer or shorter periods, and that persons with the signs of the disease have been able to completely escape from it:¹ consequently we must sooner or later ascertain the means by which that has been effected, and then we shall apply that knowledge to the prevention and cure of this disease.

What is the cause of consumption, and how does it operate in the production of the disease? The authorities have from time to time propounded theories that were said to give satisfactory information on these points. I take as examples of these theories the following:² climate, a certain height above the sea-level, cold, change of temperature, impure air, night air, carbonic acid, bad or insufficient food or clothing, dyspepsia, the non-assimilation of fat, diathesis, disease of the nerve-centre, cough, catarrh, bronchitis, pneumonia, pleurisy, dampness of the soil, inheritance, the *Bacillus tuber-*

culosis, etc., and ask, Does any one of them afford adequate information on these points? Submit them to critical examination, and the answer to this question is an emphatic negative;¹ for they either have no foundation in fact, or have for their basis conditions that, on the one hand, occupy so wide an area of distribution that they include within their sphere of action a large number of persons who have never shown any signs of the disease, and, on the other, are so limited in the field of the disease that they are only found associated with a greater or less number of its cases, and consequently can afford no adequate explanation of its cause and mode of operation. So obviously, indeed, is this the fact, that I shall only note a few of them in passing, and then examine in detail the important, because it is popular, theory of Koch.

Is consumption limited to, or even more prevalent in, any particular climate? No: the disease is co-extensive with the civilized world. Truly, consumption is more prevalent below than above certain altitudes, but within the same limits the vast majority of the human race is living free from the disease. Further, while on the one hand consumption is found at high altitudes, as in Madrid and in certain cities in South America, on the other it is unknown in certain tribes inhabiting districts below the sea-level in Asia. To cold and change of temperature has generally been assigned an important place. That is an error; for in cold climates, as in Canada, Sweden, and such places, as well as in the classes most exposed to cold, there is little consumption, and in the severe winter of 1854-55 more men died from it in the barracks at home than in the camp before Sevastopol; and a similar argument may be held with regard to the causal influence of change of temperature.

The majority of those who breathe impure air, night air, or who have bad or insufficient food or clothing, etc., do not get consumption; and the same fact holds good for the diseases that are alleged to produce it. What an appalling amount of consumption there would be if every one who had a cough, or who caught a cold, became consumptive! Dampness of the soil is another alleged cause of this disease, but in the cases cited in proof of that theory drainage was not the only factor that was present. We know that as parts of Lincolnshire get drained, ague disappears, and consumption takes its place; and we have the same fact in America and in Switzerland.² There was the least consumption in the most wet department of France. Consumption

¹ Sydenham, Walshe, Laennec, Heitler, Roger and Boudet, Ewart, Frienné, Fuentes, Blake, Herman Weber, Cruveilhier, Pollock, Austin Flint, Fuller, Stokes, etc.

² Williams, Fuchs, Murthy, Bouilland, Scot-Allison, Briquet, Boyle, Baude-
loque, Bucheteau, Shephard, MacCormac, Ruchle, Herard and Cornil, Bou-
chardat, Bennett, Hutchinson, Brakenridge, Dobel, Lebert, Lugol, Allbut, Rob-
erts, Memeyer, Clark, Williams, Broussais, Grisolle, Buchanan, Bowditch,
Thompson, Cotton, Roberts, Koch, etc.

¹ Louis, Hanot (Jaccoud's Dictionary), Andrew, Pollock, Ziemssen.

² Haviland, Kelly, Green (U.S.A.), Damaschind.

is comparatively rare in pure wet, undrained districts, and a majority of consumptive patients have not been subjected to the influence of dampness of the soil. The theory of the inheritance of consumption is still generally accepted, although no evidence has been adduced in its support. At birth the child of consumptive parentage has the same type of chest, the same proportion of chest-girth to height, as that possessed by children of healthy parents, and there are no means of distinguishing the lungs of the one from those of the other. The fact that some of the children of consumptive parents subsequently themselves suffer from this disease is not evidence that consumption was transmitted from the parents to those children. A large number of children, even where both parents have died from consumption, remain absolutely free from it.¹ Is it so unreasonable to expect the conditions that produced the disease in the parents will later on repeat the process in those of the children that are submitted to their action, that we must resort to a pure hypothesis for an explanation of those facts? The theory is only alleged to account for a small part of the cases of consumption, and we cannot accept an hypothesis where we already have a reasonable explanation of the subject.

I pass now to the theory that the *Bacillus tuberculosis* is the cause of consumption, and I ask, What evidence is there to prove this theory? Koch² experimentally introduced the bacillus into a number of animals, some of which were invariably attacked by consumption, others had a greater or less liability to it, and the remainder were totally free from the disease. We have to examine the successful experiments. They were made upon animals that were most liable to "spontaneous" consumption, and their value rests upon the fact that the animals that were not inoculated were found healthy. Now, Koch himself noted, that, if these animals were kept too long before they were inoculated, they also became diseased. So there was only a difference of time between the inoculated and non-inoculated animals that became consumptive, and consequently the value of the so-called "control" evidence entirely disappears.

What produced consumption in the non-inoculated animals? According to the theory, the inhalation or other introduction of the bacillus. Just so; but where is there any evidence of that? The previous experiments do not prove that the bacillus can produce consumption, and to offer that explanation is to assume the precise point the experiments were intended to prove.³ Further, these animals were subjected to the conditions of confinement. What effect did those conditions produce on the animals? Koch ignored them and their effects, and by so much vitiated his conclusion, even if that conclusion had been otherwise established. The bacillus, its containing medium, or the changes effected, were evidently powerfully irritant; and it would indeed be surprising if, when introduced into animals so liable to consumption and subjected to the conditions of confinement, the disease were not both more rapidly manifested and of a more extensive character. Therefore Koch's experiments do

not in any way warrant the inference he has drawn from them; and once again a great discovery has had its true import temporarily overshadowed by a misinterpretation of its real significance.

How does this theory accord with the known facts of the case? Tubercles in various stages, young and adult, are found in which there are no bacilli, while in the same specimen caseous tubercles may be present containing bacilli.⁴ There are cases of consumption in which the bacillus is absent both during life and *post-mortem*.² The physicians, clinical clerks, nurses, *post-mortem* room attendants, and those who clean the wards of consumptive hospitals, are not attacked by the disease.³ Patients suffering from bronchitis, pneumonia, etc., occupy beds adjoining consumptive patients for long periods, but they do not become consumptive. The friends of patients who regularly visit them in these institutions do not get it. Some wards at Brompton had their ventilating-shafts stopped, but no attack of consumption followed either in the patients suffering from other chest complaints or in the attendants.⁴ These institutions are not centres from and around which the disease spreads. Yet here are the most favorable conditions for its rapid and unquestionable propagation; and we have only to substitute small-pox, scarlet-fever, or any of the infectious diseases for consumption in the above conditions to realize what must happen if it were an infectious disease. And so widely is this bacillus distributed, so tenacious is it of life, and so constantly are we, especially when suffering from respiratory diseases, exposed to its action, that on the assumption of its potency it is impossible to account for the comparative smallness of the number of consumptives.

We pass from these contradictory and most unsatisfactory theories to the consideration of one that is both in strict accord with and capable of affording an adequate explanation of all the known facts of the case. The theory my investigations have led me to hold may be stated as follows: that consumption is the direct result of the reduction of the breathing surface of the lungs below a certain point in proportion to the remainder of the body, and is solely produced by conditions that tend to reduce the breathing capacity.

I have experimentally produced consumption by these conditions. On one occasion I took a well-developed chest, and gradually submitted it to conditions that tend to reduce the breathing capacity, and at the same time, so far as possible, placed impediments to the performance of compensatory action by other organs. At first there was a reduction of the chest-girth, a wasting of the muscles, a loss of the range of extension, the well-known change in shape, and increased frequency of breathing. This was soon associated with catarrh, pain in the chest, steady loss of weight, and hectic; and the process was continued until I was satisfied that consumption was well established. Then I induced compensatory action by other organs, and submitted the lungs to conditions that tended to develop them. This was followed by great relief in the chest symptoms, which eventually completely disappeared, by a restoration of the general health, a return to the normal weight, a change in the

¹ Thompson.

² Report of Koch's Experiments (British Medical Journal), Watson, Cheyne, Spina (Sutler).

³ Cadéal and Malet's Experiments (British Medical Journal), Brown-Sequard's Experiments (Lancet).

⁴ Klein.

⁵ Pollock, Cotton Andrew.

² Spina, Sir Andrew Clark.

⁴ Pollock.

shape of the chest in an opposite direction; and I continued the process till the chest had regained its full development and there was sound health. Each step in the experiments was carefully verified, the same sequence of events was invariably observed, and I have both traced the presence of these conditions and watched their progress in many cases of consumption.

We can at any time watch the direct production of consumption by the constant inhalation of small particles of various substances in strong healthy men who have been brought up in the country, and we know the disease has been produced in this way for generations. Masons, builders, wool and cotton manufacturers, quarrymen, cutlers, file-makers, earthenware manufacturers, etc., supply a large contingent to the mortality from consumption.¹ Occupations that are carried on in small, crowded, or badly ventilated rooms, where the respiratory functions are impeded, or those in which there is a long-continued cramped position of the chest, have long been notorious for the production of consumption. We have examples of this in the case of Manchester warehousemen, drapers, tailors, shoemakers, watchmakers, printers, clerks, and students.²

The army supplies us with a practical demonstration of the direct production of consumption by such conditions. Each recruit is specially examined with reference to consumption, and three months after he has entered the army he is again examined, when, if any indication of the disease be found, he is at once dismissed the service. These men are placed under the supervision of skilled medical officers; their food, clothing, and home are assured them; they are in the prime of life; and any illness they may have is at once attended to. Yet, notwithstanding this doubly certified freedom from consumption, and these great advantages, the loss to the army from this disease is much higher than that of the worst district in England. During the six years 1880-85 there were, on an average, 1,330 admissions into hospital, 263 deaths, 215 invalids sent home from abroad, and 474 invalids discharged the service. Army medical authorities³ are agreed in attributing this "generated" disease to the conditions of army life; and of these they attach most importance to the large amount of time spent in impure barrack air, compression of the chest by clothing, etc., alcoholism, sentry go, and specific disease, or, in other words, to conditions that tend to reduce the breathing capacity.

We have in confinement⁴ another practical demonstration of the direct production of consumption by conditions that tend to reduce the breathing capacity. Prisoners, orphans, and the insane formerly suffered terribly from this disease. At one time the mortality of the white prisoners of New York from consumption was three times that of the population, and the mortality of the black was double that of the white prisoner.

In the so-called "inherited" consumption there is yet another sad example of the direct production of the disease by such conditions. Look, on the one hand, at the conditions under which these children are brought up from birth, at

the early age at which the disease appears, at its greater frequency in the daughters of consumptive mothers, and, on the other, at the plain evidence of the effect of these conditions that is seen in the arrested or retarded development of their chests.

Strong healthy countrywomen, who were accustomed to work in the fields, went to Paris, wore stays for the first time, and furnished the majority of Louis' patients. Tall men, who in proportion to their height are small-chested, and narrow-chested men, are notorious for their great liability to the disease. The association between repeated injury to the lungs by certain diseases and consumption has attracted the attention of most observers. We know that our cities are the chief centres of consumption, that the main tendency of city life is to reduce the breathing capacity, and that men who have been brought up in the country supply the majority of its victims. We also know that in the country such tendencies dominate the sphere occupied by the women who are liable to this disease, and that the female mortality exceeds that of the male.

Further, we have the same relationship between these conditions and consumption in the animals under our control. Many investigators have produced consumption in animals by strict confinement.¹ Wild animals kept in the great national menageries, cows stabled in cellars underground in large cities, and our own domestic pets, alike become its victims. And where is there a case of consumption, experimental or not, in which such conditions were absent?

I have carefully sought in vain for the record of such a case. Now, if the interpretation that has been placed upon these facts is true, then we shall find ample evidence of the action of those conditions in the disease itself. They tend to reduce the breathing capacity: consequently their effect must be a progressive reduction of the breathing surface of the lungs, and that is precisely what we have. Long before we get the so-called signs of the disease, we have a progressively lessening chest capacity, that goes² on to the end. I have shown, I trust not too briefly, that conditions that tend to reduce the breathing capacity can and do produce consumption, and that they are the dominant factors of, and co-extensive with, the field occupied by this disease. Let us now glance at the dominant conditions of the field in which consumption is unknown: for there are still places in Asia, Africa, and America in which there is no consumption; and in some of these the inhabitants have no word for the disease, and do not know what it means. Travellers inform us that these people spend the whole of their lives in active exercise in the open air, that they hold themselves erect, bearing the weight of their shoulders on the spine, and that their chests are broad, deep, and freely movable. And there is no record of consumption being found in animals in their wild state.

But this area of freedom from consumption is being steadily diminished by the introduction of civilization,—that is, of conditions that tend to reduce the breathing capacity,—and that is invariably speedily followed by the first appearance

¹ Lombard.

² Supplement to Registrar-General's Report, 1870-80.

³ Parkes, Aitken, Welch.

⁴ Taennec, Cruveilhier, Peter.

¹ De Musey, D'Arboval, Rayer, Brichteau.

² Hutchinson, Stokes, Ransome, Graham, Balfour.

of the disease. The native races of America were free from consumption till they came in contact with Europeans, and began to adopt their habits and mode of life; and the amount of this disease actually present in the American Indians has recently been shown to correspond with the extent of their civilization.¹ So, also, were the South Sea Islanders, the Maories, the New Britons, and the natives of the African coast. The same process is now marking the progress of civilization among the natives in the interior of Africa, Asia, America, and New Britain. We have the same sequence of events in the great mortality of the dark races that settle in our cities and large towns; and in civilized countries the classes that were formerly free from consumption, for example, mountaineers and our own Highlanders, are now being attacked by the disease, as the direct result of a corresponding change in their habits and surroundings.

What is the mode of operation of the conditions that tend to reduce the breathing capacity in the production of consumption? In a true state of health the lungs have a sufficient breathing surface, not only to perform their ordinary functions, but also to meet within certain limits any extra demand that may be made upon them. When they are subjected to conditions that tend to reduce the breathing capacity, they lose this power of adjustment to their external conditions, and subsequently become unable to effect the whole amount of those interchanges that constitute their ordinary function. That part of those interchanges that is not effected by the lungs, being necessary to meet the ordinary requirements of the body, will be at once added to the work normally performed by one or more of the other organs; and, so long as this compensatory work is accomplished without causing a disturbance of their functions, a temporary adjustment will have been effected, and there will be no obvious disturbance of the general health. But unfortunately these conditions continue in active operation, there is progressively increasing reduction of the breathing capacity, and consequently there comes a time when this compensatory work is not effectively performed by other organs, and there is either a greater pressure of work thrown on the lungs, or over-activity of one or more of the other organs, indicated by some mode of disturbance of the general health.² The imperative demand for the effecting of these interchanges causes in the parts least able to meet it, as a rule the apices, the phenomena of irritation, which is, as we know from the experimental production of tubercles by irritation,³ manifested by tubercular change. Each point of these morphological changes produces a further reduction of the lung capacity, and by so much becomes an addition to the forces that increase the inequality between the amount of lung available and the amount of work it has to perform; and so there is more irritation of the lungs, and more work thrown on the other organs, disturbing their functions and deranging the general health. Further, as the foci of morphological change multiply by reason of the progressive increase of the conditions that produce them, there is increased pressure and lessened supply of nutrition, accom-

panied by local congestion; so that they become deprived of nutrition, necrosis takes place, and eventually cavities are formed. Hence there is more and more work thrown on the other organs, causing increasing disturbance of their functions, and consequently more and more disturbance of the general health, till first one organ and then another becomes so greatly deranged that the so-called complications of the disease are produced; and this process goes on till at last neither lungs nor the other organs are together able to effect those interchanges without which life cannot continue.

Glance for a moment at the course of consumption when viewed in the light of this interpretation of its nature. Instead of its "uncertain and mysterious" advent, its "protean" forms and "chameleon" changes, we now see before us a perfectly natural succession of events, whose *raison d'être* order of sequence and relationship to each other can be laid down with exactitude. We have, in the first place, the lowered or arrested vital capacity progressively decreasing, associated with a progressive decrease or arrest of the size and extent of movement of the chest, the wasted or non-developed muscles, the sloping shoulders, and the changing shape of the thorax. At a certain point in this course there appear occasional, and then frequent, indications of increased activity of one or more of the other organs; there is increasing liability to "catch colds," and increasing difficulty in getting rid of them; and there are signs of the derangement of the general health and increasing weakness, accompanied by indications of lung irritation and implication. This may be followed by a period of rest; there has been a temporary adjustment between the work to be done and the work effected; and in common parlance the patient has been "patched up," if he is under treatment. Then the area of lung implication spreads, the signs of lung irritation become more marked and troublesome, the general functions are greatly deranged, the appetite fails, the body-weight seriously decreases, hectic is present, and the patient's rest is disturbed. This also may be followed by a period of rest, a balance having been effected between the work now required and that accomplished. And these periods of attack and rest go on, the attacks increasing and the rests disappearing, until so much destruction has been effected that the body is no longer able to resist the disease, and death terminates this unequal combat.

Whatever condition of man's habits, mode of life, and surroundings has a tendency to reduce the breathing capacity is a potential cause of consumption; and it is an active cause in its production, unless and until its action is counteracted or compensated. It is evident that we have not to deal with the mere temporary or accidental presence of such conditions, but with those only that have a continuous or permanent character. We may consider these conditions from the point of view of whether their tendency is expressed by disuse of the lungs or by their forcible compression or injury. The most important place in the former must be assigned to the rapidly decreasing amount of muscular exertion we require to make in order to supply ourselves with those things that are necessary for our daily wants, owing to the increasing facilities for obtaining them afforded us by means of machinery and railways. This

¹ Rush (Philadelphia), Science (New York).

² Pollack, Hanot (Jaccoud's Dictionary), Ruchle (Ziemssen's), etc.

³ Wilson-Fox, Sanderson, Simon, Cohnheim, Frankel, etc.

lessened demand for muscular exertion to obtain our necessities creates an inability and distaste for exertion to obtain those things that are not necessary; and, as there is a consensus of opinion on that point, it comes to be considered "not the correct thing" to perform any of those acts that require such exertion. Who carries any thing that he can have sent, or walks when he can ride? Who does not now ride in a closed carriage in preference to performing the journey on horseback? An obvious effect of this change is to increase the time spent in houses, manufactories, and offices, and consequently to greatly decrease that spent in the open air. Not only does man spend much more time in his habitation, but also those habitations have materially altered in character. Our sleeping apartments are no longer open to a thatched roof, our doors and windows are made to fit more accurately, and for the wide, open fireplace of our fathers we have substituted the modern grate, which appears to be kept closed on every possible occasion. In a word, the resources of civilization have been used to obtain as much difference as possible between the air in which we now pass the greater portion of our lives and that we have to breathe when out of doors. Whatsoever part of the twenty-four hours is spent in a house is so much time during which the movement of the lungs is impeded, for while there we are generally either sitting down or reclining; and both positions tend to reduce the breathing capacity, the latter more than the former. Also, as there is little muscular exertion in the house, there is a lessened production of heat, for which artificial heat is substituted; hence the great difference between the temperature of the rooms and that of the external air, the great sensitiveness to a lower temperature, and the fear of catching cold. This fear of cold leads to active measures being taken to prevent cold air entering the rooms, and consequently to bad ventilation. And this hyper-sensitiveness to cold tends either to keep us in-doors during the colder months of the year and on those days during which the temperature is lower than usual, or to induce us to so overload the body with clothes when we do go out that free movement of the lungs is impeded.

The habit of stooping, whether brought about by the shape of the chairs (they are admirably adapted for that purpose), by the habit of assuming a so-called easy position, by muscular disuse and consequent weakness, or by poring over books from the nursery through the whole course of modern education, tends to materially reduce the breathing capacity. Very efficacious in the production of chest reduction is the universal custom of both sexes to have their clothes made to exactly fit the body at a period of rest, and thereby effectively preventing any but the most limited movement. Does not this custom effectually check any tendency to movements that would necessitate more than ordinary, tranquil breathing? And have we not enforced this habit by penalizing its breach as indicating a want of *savoir vivre*? Fashion dictates the size and shape of our clothes, and our bodies have to and do conform thereto. A beautiful example of this is seen in the hideous distortion of the lower part of the chest produced by wearing a corset, that never, never is tight. The compression thus produced is one of the most powerful causes of consumption in young girls and women;

and obviously whatever produces either forcible compression of the chest or direct injury to the lungs is a cause of consumption. And when we look at the position such conditions hold in civilization, at the advances that are being made by man's increasing knowledge of the operations of nature, and his application of that knowledge to his own purposes, and at the progressive increase of such tendencies, then we see that in consumption we have one of the processes by which an adjustment is being made between the body and the work it has to perform under the changing conditions of advancing civilization, by the removal of those who have a body in excess of that work, and that the survival of the so-called fittest is thereby effected.¹ G. W. HAMBLETON.

[To be continued.]

HEALTH MATTERS.

Cookery of the Poor.

A FACULTY of social science has, it is stated, been instituted at the University of Brussels; and Professor Berger, a Belgian authority in chemistry, has given a course of lectures on alimentary chemistry. In the first of them he came to the academic conclusion that it was possible to determine with precision the quantity of nutritive elements indispensable for the reparation of the power of a working-man, and consequently the amount of money necessary for purchasing this quantity, and that therefore, when the other primary wants of a working-man were determined in the same way, the minimum of salary could be fixed with scientific accuracy. Questions of taste, digestibility, and prejudice are, however, apt to be ignored in calculations of this kind; so that, although of value as a basis of information, they are far from having the practical use which their authors ascribe to them. The knowledge of the housewife and of the cook, and a familiar acquaintance with the habits and surroundings and tastes of the laboring classes, are necessary to give reality to such calculations. An excellent example of what may be done in this way is furnished in the able and interesting chapters on the subject in the popular little handbook of domestic economy issued by Messrs. Cassell & Co., and largely used in board schools, entitled "The Making of the Home," written by Mrs. Barnett, of St. Jude's, Whitechapel. The same subject is treated with great technical knowledge and power of sympathetic feeling for the poor in her chapter on "Our National Defences," in the joint essays by herself and the Rev. S. A. Barnett, in the well-known collection of essays entitled "Practicable Socialism." The subject is one in which medical men, skilled as they are in the physiology of food, and accustomed to deal with the poor both in family life and in public institutions, might give great aid. That which the working-classes greatly need is instruction in the art of braising, or slowly stewing at a low heat, combinations of meat-scrap and of vegetables. Any thing more toothsome and nutritious than the vintagers' *pot au feu*, which, says a correspondent of the *British Medical Journal*, "I lately tasted in the Medoc during the gathering of the grapes, cannot well be imagined. It was so delicious that a supply of it was ordered into the château for mid-day lunch, and it was voted by acclamation worthy of a *cordon bleu*. It was made with leg of beef, onions, carrots, cabbage, and the like, and poured smoking into bowls over slices of thin bread. What a lesson it conveyed to our managers of soup-kitchens, and what a meal for our harvesters!"

Schmerz-Freude ("Pain-Joy").

The Berlin correspondent of the *Therapeutic Gazette* states that Professor Leyden presented to his class at Charité a young lady affected with "schmerz-freude." "It is a pity I cannot translate that name for you, for 'pain-joy' would convey no meaning to you. The patient, as the professor explained, belonged to that class of hysterical women who not only experienced no pain during an operation, but, on the contrary, had a morbid desire to

¹ Pritchard, Lamarek, Darwin, Spencer.

have otherwise most painful operations performed on them without an anæsthetic. The patient in question had, during a paroxysm of hysteria, fractured her lower jaw and injured the facial artery. The injury proved a most serious one, and necessitated the ligation of the facial and carotid arteries, and finally the removal of part of the lower jaw. The patient insisted upon having all three operations performed without an anæsthetic, and told the operator that she had derived great pleasure from the operation."

Action of Caffeine.

The Paris correspondent of the *Boston Medical and Surgical Journal* reports that at the meeting of the Academy of Medicine in March, Professor Germain Sée read a paper on the researches he had undertaken in conjunction with Dr. Lapique, his *chef de laboratoire*, on the action of caffeine on the motor and respiratory functions in a normal state and in a state of inanition, the conclusions of which may be summed up as follows: 1. Caffeine in small and repeated doses, about sixty centigrams per day, which may be prescribed with advantage to soldiers on the march, facilitates muscular work in augmenting the activity, not directly of the muscle itself, but of the motor nervous system, cerebral as well as medullary. The consequence of this double action is to diminish the sensation of effort, and to avert fatigue, which constitutes a nervous and at the same time a chemical phenomenon. 2. Caffeine prevents breathlessness and palpitations consecutive to effort, which is of great importance. 3. It thus immediately communicates to a man who gives himself up to violent and prolonged exercise the aid that he requires. 4. In producing this excitation of the cerebro-spinal motor system, on which depends the augmentation of the muscular tonicity, the caffeine augments the waste of the carbon of the organism, and particularly of the muscles, but it does not restrain the nitrogenous waste. It therefore is not, in the strict sense of the word, a means of saving (*moyen d'épargne*). 5. A saving action in general can take place in the higher animals in a complete manner to prevent the injurious effects of fasting, only in a condition impossible to realize; namely, inaction or immobility, more or less absolute where there is little expenditure without work. With caffeine, we observe just the reverse, that is to say, an intense work, which we will obtain only at the expense of the wear and tear of the organism. The animal machine can work only in consuming combustible matters, and it is precisely in promoting this combustion that caffeine permits muscular work even during fasting. 6. Caffeine has not, as is generally believed, the marvellous property of replacing food: it only replaces the general tonic excitation which the ingestion of food produces. If it be admitted that it is the direct and instantaneous action of the aliments which stimulate the stomach and the nervous system, and that their alimentary value is primarily nothing, one might substitute one stimulant for another. Caffeine, far from sparing the reserves, will place a fasting man in a position to undertake his work only by attacking these reserves, the destruction of which it hastens by the excitation of the nervous system, and, by its medium, that of the muscles. The organism will then soon use up its nutritive supply, and the caffeine will not prevent it. It is, nevertheless, of incontestable but temporary utility for the physical forces.

NOTES AND NEWS.

A NUMBER of Chicago "lady medicals" are said to have organized a committee for the purpose of securing an international congress of women physicians in 1892.

—One of the latest additions to the University of Pennsylvania is the establishment of an archaeological museum. In addition to the American specimens, the museum contains a fine collection of flints, bronze implements, and pottery from Europe, as well as objects from Asia, Africa, and the South Sea Islands.

—Dr. Rothrock, professor of botany at the University of Pennsylvania, is preparing for the establishment of a museum which promises to be of unusual industrial importance. The new collection, to be called the "Museum of Economic Botany," will consist of specimens of all kinds of woods, vegetable fibres, grains and drugs, arranged so as to illustrate the processes of manufac-

ture from the raw product, and the various uses to which each material may be put.

—A study of the figures presented in the 1890 edition of George P. Rowell & Co.'s "American Newspaper Directory" reveals some interesting facts pertaining to the business of newspaper publishing. This volume, which was issued April 1, and is the acknowledged authority on newspaper statistics, estimates the total number of papers now published in the United States and Canada at 17,760. Of these, 812 are Canadian publications. This is a net increase, since last year, of 629 in the United States and 24 in the Dominion of Canada.

—In the course of some excavations lately made at Ludwigs-hafen, on the Rhine, the tibia and two teeth of a mammoth, and the jaw of a stag, were found. The skeleton of another "antediluvian" animal, *Nature* states, was discovered in the limestone near Oberhildesheim. The researches are being continued.

—According to a French journal, the number of foreign students now studying in Paris is about 1,000, of whom 729 (107 of them women) are studying medicine, and 182 law. Literature has 66 (including 9 women), science 60, and pharmacy 23. It is remarkable, says *Nature*, that Russia furnishes the largest contingent of the foreign medical students, viz., 150; America coming next with 139. We find no mention of England. The foreign element is, on the above estimate, about one-tenth of the whole.

—At a meeting of the Société Chimique de Paris in March a paper by M. Meslans was presented by M. Moissan, announcing the isolation of fluoroform (CHF_3), the fluorine analogue of chloroform (CHCl_3). A brief abstract of this preliminary communication will be found in the *Chemiker Zeitung* for March 26. During the course of the work recently published concerning propyl and isopropyl fluorides, we learn from *Nature*, M. Meslans had occasion to study the action of silver fluoride upon iodoform. The result of this action was found to vary according to the conditions of experiment, liquid products being obtained under certain conditions, and gaseous products under others. The end result, however, was always the production of a gas, which turns out to be fluoroform. Chloroform, as is well known, is readily attacked by a warm alcoholic solution of potash, potassium chloride and potassium formate being produced: $\text{CHCl}_3 + 4\text{KOH} = \text{H} \cdot \text{COOK} + 3\text{KCl} + 2\text{H}_2\text{O}$. It is interesting to learn that fluoroform behaves in precisely the same manner, for the gas is decomposed by either aqueous or alcoholic potash with formation of fluoride and formate of potassium. On being heated to redness in a glass tube, fluoroform is also decomposed, with production of gaseous silicon tetrafluoride and a deposit of carbon. The gas is only very slightly absorbed by water, but it dissolves readily in chloroform or alcohol. Fluoroform has also been prepared by substituting chloroform or bromoform for the iodoform used in the first experiments.

—The superiority of the highways of Europe over those of the United States is one of the first things which attracts the attention of the traveller from this country. In Europe the roads are under the supervision of officials who are thoroughly trained for their work. In the United States road-engineering is committed to the control of citizens not particularly interested in this imposed task, and with no special training for their duties. The results are evident. Our public roads are a disgrace to the people. To assist in remedying this condition of affairs in Ohio, by disseminating information on the subject of roads, and proper ideas with regard to their construction and management, Case School of Applied Science, Cleveland, will give, free of charge, instruction in road-engineering sufficient to qualify a man of ordinary intelligence to properly locate and manage a highway. The instruction will consist of lectures on the following topics: location and construction of roads; keeping up and repairing roads; ditching and drainage; road-making machinery; improvement of the surface of roads, including the use of gravel, broken stone, plank, paving, etc.; highway structures, including retaining walls, culverts, bridges, etc.; cost of earthwork and mechanical structures; highway administration; and laws relating to highways. For those who desire it, instruction will be given in the use of instruments employed in road-engineering,—the compass, transit, and

level,—and in drawing plats, plans, and profiles. Besides the instruction given by the professors of Case School, practising engineers of wide experience will give lectures on special topics connected with road-making. The only preparation needed for the course of instruction is a common English education, such as is given in the district schools of Ohio. The lectures will begin the first Monday in February, 1891, and will continue four weeks. There will be no charge of any kind made by Case School.

—There is an ample demand for the increased use of soap in India; for at present, after allowing for local manufacture, it may be said of the people of India that soap is to them an unknown luxury, the consumption being at the rate of less than a shilling's worth for every hundred inhabitants a year. The imports of soap have, it is true, more than doubled during the last six years, and the trade is steadily increasing from year to year. It is not any thing like a large trade even now; for the largest quantity yet imported, that of the year ending April, 1889, reached only 74,000 hundredweight, the value of which was \$511,445. The bulk of this was from England, the other European states supplying only a little over 3,000 hundredweight. The soap-factories at Bombay, Jeypore, and Meerut are doing well, and increasing their out-turn, and the local demand will most probably now go on increasing from year to year. The soap manufactured by these companies is much liked by the natives, and particularly that variety called "vegetable" soap is in much request. Hindoos of the orthodox type would not touch a soap made of tallow or animal fat, as it is against the principles of their religion to do so. Such men and women in general, therefore, did not use soap at all, and contented themselves by cleaning their hands with simple earth, or the soap-nuts of species of *Sapindus* and the legumes of *Acacia concinna*. Since the production of the vegetable soap, the objection to the introduction of that article in the native Hindoo household is overcome, and soap is beginning to replace the primitive clay and vegetable substances used. About 8,000 hundredweight of native-made soap is now exported annually. The imports of soap of all kinds into British India have been as follows in the last six years: 1883-84, 34,447 hundredweight; 1884-85, 38,075; 1885-86, 49,804; 1886-87, 59,016; 1887-88, 61,139; 1888-89, 74,072. The imports since this have, however, been declining. Of 500,000 hundredweight of soap exported from England in 1888, 75,275 hundredweight went to India.

—The problem whether kangaroos can be acclimatized in England appears to have been solved at Tring Park by a very simple process. Hitherto it seems to have been assumed that the only chance of keeping kangaroos in that climate is to rear them on the principle which, to use a vulgar colloquialism, is known as "coddling." They have accordingly been kept and tended in pens or small enclosures, as we see them in Regent's Park. At Tring Park, however, according to the interesting account of Mr. Walter Rothschild, they have simply been turned loose in the park and woods, and the experiment has proved remarkably successful. Fifteen years since, the late Baron de Rothschild endeavored to breed kangaroos; but the male and young one were unfortunately poisoned by eating laurel,—a danger which English kangaroo-breeders will do well to note. Of late, however, the experiment has been renewed with success. They are found, we are told, to breed freely, and there are now to be seen in Tring Park twenty-eight or thirty native kangaroos, including the red and black species, Bennett's wallaby, the black wallaby, and the larger macropius, generally known as "the giant kangaroo."

—In respect to a statement alleging that the Australian Government had refused to allow M. Pasteur the reward of £20,000 offered to the person who should suggest the best plan for the destruction of the rabbits that infest that colony, M. Pasteur is reported to have said that this was not so, for the simple reason that he had never sought it, and that, owing to circumstances over which he had no control, he could not claim such a reward. He had sent M. Loir, his nephew, and another of his assistants, to Australia in order to try the experiments

which he had made in his laboratory on a more extended scale. The assistants returned to France after a few months, discouraged. According to M. Pasteur, says the *British Medical Journal*, they were not allowed by the commission appointed by the Australian Government to make any important experiments. This commission permitted the assistants to inoculate a few rabbits, and the experiments were successful enough to warrant a further extension of the authorization; but all sorts of delays and adjournments were caused, until the assistants abandoned all hope of being able to carry out the purpose for which they had undertaken the voyage to Australia.

—Ten million young whitefish from the government fish-hatchery on Lester River, Minnesota, have been placed in Lake Superior this spring, and it is intended to place fifteen million more there at once. About one-fourth of these will probably survive, maturing in four years, if the illegal work of the net-fisherman can be prevented.

—At the meeting of the Royal Society of Edinburgh on Feb. 28, Dr. John Berry Haycraft communicated the results of some recent investigations on voluntary muscular contraction. Dr. Haycraft's observations are interesting both to physiologists and to physicists. Where a muscle is stimulated by an electrical shock, all the fibres of the nerve receive the same stimulus, and all the fibres of the muscle to which the nerve passes contract together, and in the same way. This is not the case when a muscle contracts on receiving a natural nerve stimulation, starting either as a result of volition or of reflex action. The central nervous system seems unable to affect all the fibres of a muscle, through the numerous nerve-fibres passing to it, in such a manner that they all shall contract exactly in the same way. The reason for supposing this to be the case is the fact, observed by the author, that fascicular movements are always present within a muscle during a voluntary or a reflex contraction, so that tracings taken from different parts of the same muscle invariably differ from each other. The experiments were conducted, *Nature* states, both upon the human masseter and the gastrocnemius muscle of the frog. These fascicular movements occurring within it, will prevent any muscle from pulling with perfect steadiness on any lever or other registering apparatus; and the tracings taken by means of such apparatus will show oscillatory waves, often very rhythmical in their appearance. Many observers have concluded from an examination of these tracings that they indicate that the central nervous system discharges impulses into the muscle at a rate corresponding with that of the oscillations observed. Thus some observers find twenty, others ten, oscillations per second in the muscle curve, and they consider that the nervous system discharges into the muscle at these rates. The author finds that the fascicular movements just described as occurring within the muscle itself account fully for the oscillations seen, the irregular aperiodic movements of the muscle compounding themselves with the period of oscillation proper to the registering apparatus itself; for, by varying the instruments used, the resultant curves may be varied at will, slow oscillations appearing when using instruments of slow period, quick oscillations when using instruments of quick period. The author suggests that these fascicular movements probably account for the production of the muscle sound, which Helmholtz long ago pointed out was chiefly an ear-resonance sound. This, of course, could readily be evoked by any slow aperiodic movement, and the fascicular movements within the muscle must, at any rate, assist in producing it. These fascicular movements may, perhaps, account for the results obtained by Lovén with the capillary electrometer, for it is more probable that he was registering the period of his own instrument than that the muscles were twitching at the slow rate of eight times per second. If these conclusions are correct, there remains little to be said in support of the theory generally accepted, that the nervous system normally discharges nerve impulses into the muscles like shots quickly fired from a revolver. It may be that this is the case, but the subject requires more extended investigation before any definite conclusions can be arrived at.

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

SUBSCRIPTIONS.—United States and Canada..... \$3.50 a year.

Great Britain and Europe..... 4.50 a year.

Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and twenty copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

VOL. XV.

NEW YORK, APRIL 18, 1890.

No. 376.

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WE HAVE RECEIVED the prospectus of Barnard College, the institution founded last year in New York to enable women to receive collegiate instruction from the professors of Columbia College. The two corporations are distinct; but Columbia furnishes the teachers for the women's college, and confers the degrees upon its graduates. The new college was named after the late President Barnard of Columbia, in gratitude for his efforts in behalf of the higher education of women. The pamphlet now before us contains the requirements for admission to the Barnard, together with the courses of study during the freshman and sophomore years. The requirements for admission consist of the elements of Greek, Latin, and mathematics, with English grammar and composition and some history and geography. The studies of the first two years are in the same departments, with the addition of chemistry and botany and the French and German languages. It will be seen, therefore, that the founders of the new institution are no innovators, but have adopted the course of study usually pursued by young men. The studies thus far announced seem rather too largely technical, but probably those of the junior and senior years will be less so. Several post-graduate courses are also provided, with opportunity to obtain the degrees of master of arts, doctor of philosophy, doctor of letters, and doctor of science. On the whole, the programme promises well, and every friend of humanity will wish the new college God speed.

THE MARINE BIOLOGICAL LABORATORY.

THE third session (1890) of the Marine Biological Laboratory will be held this summer. The corps of instructors consists of Dr. C. O. Whitman, director, professor of zoölogy, Clark University, editor of the *Journal of Morphology*; Howard Ayers, Ph.D., director of The Lake Laboratory, Milwaukee; E. G. Gardiner, Ph.D., instructor in zoölogy, Massachusetts Institute of Technology; I. Playfair McMurrich, Ph.D., docent in zoölogy, Clark University; J. S. Kingsley, Sc.D., professor of zoölogy, University of Nebraska; H. C. Bumpus, M.A., fellow in zoölogy, Clark University; W. M. Rankin, Ph.D., Princeton College; W. A. Setchell, B.A., assistant in botany, Harvard University; Takano Ryoiche, artist; G. W. Fitz, laboratory assistant.

In addition to the regular courses of instruction in zoölogy, botany, and microscopical technique, consisting of lectures and laboratory work under the direct and constant supervision of the instructors, there will be two or more courses of lectures on special subjects by members of the staff. One such course of six lectures will be given by Dr. McMurrich on the *Hydrozoa*. Similar courses on the *Crustacea* and echinoderms will be given by Professor Kingsley and Dr. Rankin. There will also be ten or more evening lectures on biological subjects of general interest. The first of these will be given by Dr. Whitman on July 9. Among those who may contribute these lectures and take part in the discussions upon them may be mentioned, in addition to the instructors above named, the following: Professors E. B. Wilson of Bryn Mawr, C. S. Minot of Harvard Medical School, W. T. Sedgwick of the Massachusetts Institute of Technology, S. F. Clarke of Williams College; Dr. G. Baur, recently of Yale University; Dr. Henry Orr, recently of the Universities of Jena and Princeton; Dr. C. H. Eigenmann, recently of the University of Indiana; Professor W. A. Lacy of Lake Forest University; and William M. Wheeler of Milwaukee.

The laboratory is located on the coast at Wood's Holl, Massachusetts near the laboratories of the United States Fish Commission. It has already been found necessary to add to it this year a library, a lecture-room, and six more private laboratories. The building consists of two stories; the lower for the use of students receiving instruction, the upper exclusively for investigators. The laboratory has aquaria supplied with running sea-water, boats, collecting apparatus, and dredges; it will also be supplied with alcohol and other reagents, glassware, and a limited number of microtomes and microscopes. By the munificence of friends the library will be provided henceforth not only with the ordinary text-books and works of reference, but also with the more important journals of zoölogy and botany, some of them in complete series. If the necessary funds can be obtained, the laboratory will also be provided with a steam-launch, and in any event there will be opportunities for collecting material for study and investigation.

The laboratory for investigators will be open from June 2 to Aug. 30. It will be fully equipped with aquaria, glassware, reagents, etc., but microscopes and microtomes will not be provided. In this department there are fourteen private laboratories supplied with aquaria, running water, etc., for the exclusive use of investigators who are invited to carry on their researches here free of charge. Those who are prepared to begin original work, but require supervision, special suggestions, criticism, or extended instruction in technique, may occupy tables in the general laboratory for investigators, paying for the privilege a fee of fifty dollars. The number of such tables is limited to ten. Applicants for them should state precisely what they have done in preparation for original work, and whether they can bring a complete outfit; viz., microscope, microtome, camera-lucida, etc. Special attention is invited to the opportunities offered to the holders of these tables, as it is believed that they are somewhat unusual.

The laboratory for students will be opened on Wednesday, July 9, for regular courses of seven weeks in marine zoölogy and botany, and microscopical technique. Opportunities will be given for collecting and preparing material for use in the class-room and for special lines of study. Hand-lenses, dissecting-instruments, drawing-materials, etc., may be bought at cost in the lab-

oratory. It is desired that students owning microscopes or microscopes should bring them, and applicants for admission should state whether this requirement can be complied with. The fee for workers in this department is twenty-five dollars, payable in advance. The number of students will be limited to thirty, and preference will be given to teachers or others already qualified. By permission of the director, students may begin their individual work as early as June 15 without extra charge, but the regular courses of instruction will not begin before July 9. Applications for places in either department should be addressed to Miss A. D. Phillips, secretary, 23 Marlborough Street, Boston.

The Marine Biological Laboratory is intended to continue and enlarge the work of the laboratory at Annisquam, carried on for six years by the Woman's Education Association, with the co-operation of the Boston Society of Natural History. The annual reports of the trustees, containing an account of its organization and work, may be obtained from the secretary.

BOOK-REVIEWS.

The Anatomy of the Frog. By Dr. ALEXANDER ECKER. Tr. by George Haslam, M.D. Oxford, Clarendon Pr.; London, Henry Froude; New York, Macmillan & Co.

THIS volume is No. II. of the "Translations of Foreign Biological Memoirs." The first part of Ecker's "Anatomie des Frosches" appeared in 1864, and the second part sixteen years later. This was the groundwork on which Dr. Haslam prepared his "Anatomy," adding many facts which he deduced from his own personal investigations, and in general bringing the book up to date by including the results of recent researches. It may seem to many rather peculiar that so much labor should have been expended on the study of the minute anatomy of so insignificant a creature as the frog; but when it is remembered that for many reasons the frog has for years been studied by scientific men to elucidate intricate physiological problems, and that to-day no animal is more commonly found in physiological laboratories than the frog, this peculiarity will cease to exist. It would be interesting, did our space permit, to review the intimate relations which the frog has sustained to important discoveries. Swammerdam, more than two hundred years ago, called attention to the advantages which the frog possessed as an aid to scientific study. It was from accidentally observing the contractions of the muscles of the denuded hind-legs of a frog that Galvani was led to abandon all other occupations and investigate the phenomena which were the basis of Galvanism.

Our knowledge of the capillary circulation of the blood rests upon Leeuwenhoek's observations of the web of the foot of this animal, and the gills and tail of its tadpole; and to-day the frog affords almost the only material for the investigation of the excitability of nerve and its associated electromotive changes. Histology is also deeply indebted to the frog for its present status. The structure of nerve-fibres, their origins and terminations, and the structure of muscular fibres, have all been studied more in the frog than in any other creature. These and many more reasons might be given in justification of devoting so much time and labor to the preparation of a book of such size on such a restricted subject. As a book of reference, the volume is invaluable to every biological student. It is very complete in all its parts, besides being admirably printed and illustrated. Taken as a whole, it might well serve as a model to all publishers. The paper and the type are especially worthy of commendation.

Practical Electricity in Medicine and Surgery. By G. A. LIEBIG, Jun., Ph.D., and GEORGE H. ROHÉ, M.D. Philadelphia and London, F. A. Davis. 8°. \$2.

ELECTRICITY is becoming more and more each day an important adjunct to both the physician and the surgeon in their battle with disease. Whereas a few years ago no one but a specialist was expected to know any thing about the practical application of electricity in medicine, to-day many physicians in general practice, and laying no claim to being specialists,

have in their offices the appliances necessary for the treatment of disease by electricity. Drs. Liebig and Rohé have therefore, in issuing this book, supplied a guide in a comparatively new field, to those who have up to this time failed to find in the literature of the subject all that was necessary to enable them intelligently to make a practical use of so important an agent as electricity.

This volume is divided into three parts. In Part I. the various forms of electrical and magnetic apparatus are described which are likely to be of use to the physician, together with the best arrangements of cells for any given work, the construction and use of galvanometers, the theory of the chemical action taking place in the storage-cell, and the best methods of caring for batteries. The electric motor, the telephone, and the phonograph are also here described. Part II. describes the effects of electric current upon the body in health and disease. Part III. treats of the application of electricity to the treatment of disease.

The work is a most valuable contribution to the elucidation of a most intricate subject, and coming just at this time, when there is such a general interest in the manifold applications of electricity, must receive a cordial welcome not only from members of the medical profession, but also from scientists generally.

Notes on American Schools and Training Colleges. By J. G. FITCH. New York, Macmillan & Co. 16°. 60 cents.

THIS little book, reprinted from a report to the English Education Department, contains the observations made by the author after a visit to the schools of this country. Mr. Fitch's opinion of American public schools is in the main very favorable; and the criticisms he makes on particular points, together with his occasional comparisons between our schools and the English, ought to be useful to American educators. The chief excellence that he notes in our school system is the enthusiasm shown, not only by teachers, but by the public as well; while the chief defect, in his opinion, is the excessive minuteness with which the lessons and the mode of teaching them are prescribed, so that nothing is left to the spontaneity and originality of the teacher. He dwells upon this topic at considerable length, remarking that "text-books and certain accepted formulas appeared to dominate the work of the classes too much," and adding that English teachers would find such minute regulations an intolerable restraint. He maintains at the same time that the English elementary schools give as good an education as those of this country. With regard to training-colleges, or, as we call them, normal schools, Mr. Fitch thinks we are as yet but poorly equipped, the number of such institutions being far too small for the work required. He notes, however, that certain other modes of training supply to some extent the place of normal schools; and he dwells with special interest on the teachers' associations and reading-circles, which he regards as admirable features of our educational system. As he came here to study the public schools, he has very little to say about the colleges and universities, what he does say relating almost exclusively to the worthlessness in general of American college degrees, — a matter that has been much discussed among ourselves, and as to which the author's remarks are not a whit too strong. We commend the book to the notice of American educators.

Practical Electrics: A Universal Handy-Book on Everyday Electrical Matters. New York and London, Spohn. 8°. 75 cents.

THIS practical volume is a reproduction of a series of papers on electrical subjects which originally appeared in the third series of "Workshop Receipts." It is intended mainly for that large and rapidly growing class of scientific amateurs and conscientious artisans who, through inclination or necessity, are led into the field of electrical practice without having time or opportunity to make a thorough study of the subject. In other words, it contains a fund of information of an eminently useful and practical character, though not what

may be looked for in more complete treatises on the subject. To those having electric bells, telephones, or electric lights in their houses, and who are not practical electricians, the volume will be found a convenient reference-book, containing many valuable suggestions.

Among the subjects discussed in the book are electrical connections, alarms, batteries, bells, carbons; induction, intensity, and resistance coils; dynamo-electric machinery; fire risks; electrical measurements; microphones; electric motors; phonographs; photophones; accumulators; and telephones. A sufficient number of illustrations are introduced to make clear every point touched upon.

AMONG THE PUBLISHERS.

A NEW book by Dr. J. G. Fitch, entitled "Notes on American Schools and Training Colleges," has been issued recently by the Macmillans. The well-known "Lectures on Teaching," by the same author, has passed through many editions, having been adopted for use by the Teachers' Reading Circles throughout the country.

—Ward, Lock, & Co. will publish early in May Lane's "Manners and Customs of the Modern Egyptians."

—The J. B. Lippincott Company have in press "Economic Basis of Protection," by Professor Simon N. Patten of the University of Pennsylvania.

—Macmillan & Co. will publish at once a timely book on the silver question, to be entitled "Silver in Europe," by S. Dana Horton, a delegate of the United States to the International Monetary Conference held in Europe in 1878 and 1881.

—D. C. Heath & Co. of Boston issued last week "Deutsche Literaturgeschichte," Vol. I., by Professor Carla Wenckebach of Wellesley College. The purpose of this work, which is to be in three volumes, is to offer students a history, in the German language, of the growth of German literature.

—Pictures of fifteen representative houses built through the agency of building and loan associations will appear in W. A. Linn's article in the May *Scribner*, with the story of how each one was built told by the owner. Brooklyn, Rochester, Pittsburgh, Reading (Penn.), Cincinnati, St. Paul, New Orleans, and San Francisco are among the cities represented.

—De Wolfe, Fiske, & Co. have published "Lake Champlain and its Shores," by W. H. H. Murray, a narrative of the traditions and history of Lake Champlain, with a description of yachting, camping, and fishing. Mr. Murray's chapter on the great national park is included in the volume.

—Professors Lewis M. Haupt and Edmund J. James, of the University of Pennsylvania, have just completed a monograph on "Canals and their Economic Relation to Transportation." The former deals with the technical side of the question, while the latter discusses its economic aspects.

—Clarence Deming has found, in the manuscript diary of William Brisbane of South Carolina, some pen-pictures of the First Napoleon, as he appeared to Mr. Brisband when he visited Paris in 1804. The most interesting of these, describing the coronation procession, the presentation of colors on the Champ de Mars, etc., will be published in *Scribner's* for May.

—The *Annals of Gynecology*, formerly published in Boston, has been enlarged and a new department added, the name being changed to *Annals of Gynecology and Paediatrics*. The latter department is under the editorship of Dr. Louis Starr of Philadelphia, formerly professor of diseases of children at the University of Pennsylvania. The journal appeals with more than ordinary interest to the mass of the profession, in that it deals exclusively with the diseases of women and children. It is now published by the University of Pennsylvania Press.

—The leading article in *Garden and Forest* for last week is dedicated to the memory of Dr. George Thurber, in whose recent death America has lost her most accomplished horticultural

writer. Professor Beal, in the same number, writes of the methods of botanical study; Mr. Sereno Watson describes a new *amaryllis*, which is also figured; Secretary Williams discusses the best grapes for home use; and much timely horticultural matter is given, including a description of the Easter flowers in New York. Besides the plant portrait, there is a view of The Parterre, Fontainebleau, with explanatory text.

—In the article on Millet in *Scribner's* for May, T. H. Bartlett tells of the meetings in Millet's house in Barbizon of "the most illustrious company of artists that ever sat around a table together,"—Corot, Daumier, Barye, Rousseau, and Diaz. The following anecdote is related: "At all these gatherings, when Diaz was present, there was an accustomed break in the ceremony. He had a wooden leg, and hated, above all things, talk on art; and whenever the moment of exhausted patience came, he would pound the table with his hands, imitate a trumpet with his mouth, bring the end of his stump up against the under side of the table with a fearful thump, and cry out like a wild man, 'Thunder of all the Gods, give us peace! Can't you content yourself by making art all day without gabbling about it all night? Close up!' For each and every one he had some special designation: of Rousseau, whenever he began to speak, 'Oh, there! Rousseau is going to unscrew his chair.' When his own opinion was sought, he would always reply, 'Oh, yes! oh, yes!' no matter what the question was or subject discussed. As they did not 'close up,' Diaz would get up and leave in high indignation, hearing as he passed out of the room this comforting assurance, 'Blessed is the door that hides you.'"

—The opening article of *The Chautauquan* for May is by the English historian, Edward A. Freeman, and is the first of a two part paper on "The Making of Italy;" James A. Harrison, LL.D., of Washington and Lee University, takes "The Archaeological Club in Italy" through the period of the renaissance in architecture and sculpture; Bella H. Stillman continues her studies of "Life in Modern Italy;" Professor Adolfo Bartoli contributes a paper on "Italian Literature;" Professor Henry A. Beers of Yale University takes for his theme Browning's drama of "King Victor and King Charles;" Principal James Donaldson, LL.D., of the University of St. Andrews, Scotland, writes on "Roman Morals;" the "Map Quiz" this month is on the present Kingdom of Italy; Albert Shaw, Ph.D., contributes a study of "The Servian Kingdom;" some facts about color-blindness will be found in the article by Professor Edward L. Nichols of Cornell University; Arabella B. Buckley considers the moral teachings of science; John R. Spears writes of "The American Navy;" a sketch of the life of Salmon P. Chase is given by his private secretary, Eugene L. Didier; "Woman's Work in Archaeology" is a translation from the *Deutsche Rundschau*; Thomas Bertrand Bronson of Michigan Military Academy gives the status of the present political parties in Germany; an interesting paper on "The Literature of the Irish," by John Hull, follows; and J. W. Hamilton, D.D., asks and answers some questions about the faith-cure.

—The long-promised article by Henry George appears in the April *New Review*. The same number contains a timely paper on "The Fall of Prince Bismarck."

—E & F. N. Spon have just published "A Practical Treatise on the Manufacture of Vinegar and Acetates, Cider and Fruit-Wines," edited from various sources by William T. Brannt. It is an octavo volume of 479 pages, illustrated by 79 engravings. Besides the subjects mentioned in the title, it treats of the preservation of fruits and vegetables by canning and evaporation; the preparation of fruit-butters, jellies, marmalades, catchups, pickles, mustards, etc.

—In *The Ladies' Home Journal* for April, "How to Act before the Camera" is told by A. Bogardus, the pioneer of New York photographers; Henry Ward Beecher's love for gems and rare stones is told by himself in several unpublished letters; and Mrs. Moses P. Handy has a timely article on "How to Move Easily and Well."

—Messrs. Ginn & Co. announce to be published next month "The Nine Worlds: Stories from Norse Mythology," by Mary E.

Publications received at Editor's Office,
April 7-12.

- CASPAR's Directory of the American Book, News and Stationery Trade. 2 vols. Milwaukee, Wis. C. N. Caspar. 1494 p. 8°. \$12.
- EIMER, G. H. Organic Evolution as the Result of the Inheritance of Acquired Characters according to the Laws of Organic Growth. Tr. by J. T. Cunningham. London and New York, Macmillan. 435 p. 8°. \$3.25.
- FITCH, J. G. Notes on American Schools and Training Colleges. London and New York, Macmillan. 183 p. 16°. 60 cents.
- KIMBALL, A. L. The Physical Properties of Gases. Boston and New York, Houghton, Mifflin, & Co. 238 p. 12°. \$1.25.
- LUBBOCK, J. Scientific Lectures. 2d ed. London and New York, Macmillan. 228 p. 8°. \$2.50.
- NEW HAMPSHIRE State Board of Health, Eighth Annual Report of the, for the Eighteen Months ending Oct 31, 1889. Manchester, State. 366 p. 8°.
- SLINGO, W. and BROOKER, A. Electrical Engineering. London and New York, Longmans, Green, & Co. 631 p. 12°. \$3.50.
- ZOE. A Biological Journal. Vol. I. No. 1. March, 1890. m. San Francisco. Zoe Publ. Co. 32 p. 8°. \$2 per year.

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—Longmans, Green, & Co. will shortly publish, both in London and New York, "The House of the Wolf," a romance by Stanley J. Weyman. It tells the perils and bravery of three young brothers in the fortnight before and after the massacre of St. Bartholomew's Day.

—Messrs. Ginn & Co. announce to be ready in May or June "Elements of the Calculus; Method of Rates," by A. S. Hardy, professor of mathematics in Dartmouth College. This text-book is based upon the method of rates. The object of the differential calculus is the measurement and comparison of rates of change when the change is not uniform. Whether a quantity is or is not changing uniformly, however, its rate at any instant is determined essentially in the same manner: viz., by letting it change at the rate it had at the instant in question, and observing what this change is. It is this change which the calculus enables us to determine, however complicated the law of variation may be. From the author's experience in presenting the calculus to beginners, the method of rates gives the student a more intelligent, that is, a less mechanical, grasp of the problems within its scope than any other. No comparison has been made between this method and those of limits and of infinitesimals. This larger view of the calculus is for special or advanced students, for which this work is not intended; the space and time which would be required by such general comparison being devoted to the applications of the method adopted.

—The February number (No. 45) of the Riverside Literature Series (published quarterly during the school year 1889-90 at 15 cents a single number, by Houghton, Mifflin, & Co., Boston) contains "The Lays of Ancient Rome," by Thomas Babington Macaulay, with the author's introductions and historical notes. The old Latin literature of the Romans had entirely disappeared, and the stories and legends about the early history of Rome were incorporated into the writings of the later historians without any written authority for them. These "Lays of Ancient Rome" were written by Macaulay as an attempt to show how these legends and stories about the early history of Rome would have been sung by the old ballad-mongers, as they wandered from village to village, and repeated to an eager crowd of listeners these old songs which all knew so well and yet always loved to hear. The lays have always been liked by children on account of their life, movement, and romantic incidents, and in this new form the publishers hope that they will gain a still greater and more widespread popularity.

—The University of Pennsylvania has published a translation of "The Federal Constitution of Switzerland," by Professor Edmund J. James. The Constitution of Germany had previously been issued in the same series, so that American political students now have the means of comparing those two important federal governments with our own. The principal difference between the Swiss Constitution and ours is in the executive authority, which in Switzerland is vested in a Federal Council of seven members chosen by the two houses of the national legislature. All executive orders are issued in the name of the council, and, though there is a president of the council, he is nothing but a moderator, with no more authority or dignity than any other member. The present Constitution went into effect in May, 1874, and gives to the central government much greater authority than it had before. Nevertheless, there are strong local and democratic elements in the government still, as a perusal of this pamphlet will show.

—Professor John Fiske will open *The Popular Science Monthly* for May with an account of the life of Edward L. Youmans,

including the story of his association with Herbert Spencer. Professor Fiske was a warm friend of the late Professor Youmans, and describes his fruitful labors in popularizing science and the evolution philosophy in America with sympathetic appreciation. Herbert Spencer has decided to publish the opening chapters of one of the uncompleted parts of his system of philosophy, dealing with morality. Three of these chapters, treating respectively of "Animal Ethics," "Sub-human Justice," and "Human Justice," will be printed in the same number under the general title "On Justice." "Sumptuary Laws and their Social Influence" will be discussed by Dr. William A. Hammond. Dr. Hammond shows the absurd failures of laws against fine dress, costly food, and smoking, in Rome, France, Turkey, and England, and against the selling and drinking of alcoholic liquors in some of the United States. A careful comparison of secondary school programmes, French and American, will also appear in the May number. The author, Mr. George W. Beaman, maintains, that, if our high and preparatory schools are to compare well with those of France, the pupils must not only do more work, but they must also work on more distinctly specialized lines.

LETTERS TO THE EDITOR.

Anemometry.

It is generally known that quite recently there have been two independent series of investigations of the relation of cup motion in the Robinson anemometer to wind travel,—the one in England, with an arm twenty-nine feet long, upon which the anemometer was whirled in the open air; and the other in this country, with arms of twenty-eight and thirty-five feet and used in a large closed court. It has been charged that the experiments in this country were modelled after those in England; but this is not the fact, for the experiments in Washington were nearly completed before a word had come over regarding the others. A good proof of this is found in the fact that Professor Marvin was so successful in refining the apparatus and in using electrical contacts, that it required only a few hours to show that no experiments of value could be tried in the open air, while this has been learned in England only after many months. In the January number of the *Quarterly Journal of the Royal Meteorological Society* there has appeared a second series of experiments tried in England, which are quite interesting and in many respects novel.

The earlier results showed that at low velocities there were very great irregularities, though these practically disappeared at fifteen miles per hour. In the open air the free wind would undoubtedly equal a slow motion of the whirler; and as has been shown, under these conditions, the factor would be made twenty-five per cent too small. If we add to this the effect of irregularities from whirls in the air and in the experiments, nearly all the difficulty would be accounted for.

To account for these irregularities, it has been suggested that in the open air the more or less intermittent action of the wind would tend to continually accelerate or retard the cups; and, since they have a momentum, this would tend to carry them faster than the wind during the retard, so that there would be a gain in the total movement recorded by the cups over the motion of the whirler and the free wind. This view loses sight of the very important consideration that during a rising wind the cups would lag behind, and presumably just the amount of the acceleration during a falling wind. This point could only be settled by experiment, and the following facts seem to show that this supposed effect is either inappreciable or just the contrary to what is desired.

1. The weight of a very light set of cups was increased four-fold, and in the open air there was no change in the result.
2. Two sets of cups, which were exactly alike except that one was eight times as heavy as the other, were compared side by side. It was found that in light winds the lighter cups gave two to four per cent more wind, and that they were alike in higher winds.
3. Professor Marvin increased the moment of inertia two to

three times in a set of cups, and found that the lighter gave more than ten per cent more wind at five miles per hour, while there was no difference between the light and heavy cups in higher winds.

4. In the more recent trials in England, an anemometer was placed, with its axis horizontal, on the arm of a whirler, and the whirler rotated once and then suddenly stopped: the anemometer cups (supposedly from their momentum) continued to revolve. This experiment was certainly most remarkable. It is a little difficult to see what other result was to be expected. If any thing was to be learned, it could only be by stopping the cups at exactly the moment the whirler was stopped. This certainly does not elucidate in any way whatsoever the supposed inertia effect in an intermittent wind.

5. The crucial test in the English trials was made when the whirler was given an intermittent motion or one simulating a natural wind. The anemometer was placed on the end of the arm, and the velocity of the whirler was changed quite rapidly, ranging back and forth between forty and ten miles per hour,—a far greater fluctuation than can occur in the free air. Here, then, above all things else, we ought to get an inertia effect; but it was found that there was no difference in the record of the anemometer between the uniform and intermittent motion. The evidence seems to be overwhelming that the supposed momentum or inertia effect is purely imaginary.

We cannot sympathize with the feeling aroused in England by these experiments; namely, that the Robinson anemometer is untrustworthy. Undoubtedly the Kew instrument, with its 12-inch cups and 24-inch arms, is exceedingly clumsy, and should be discarded as soon as possible; but the experiments in this country have shown that with 4-inch cups and 6.72-inch arms the results are all that could be asked near ten miles per hour, and during about eighty per cent of our winds. It has also been demonstrated that an anemometer can be constructed which will give very good results over a large range of wind velocity. It is very certain that the Robinson anemometer is far ahead of any instrument that requires a vane. In the English trials a vane anemometer or air-meter gave much more

uniform results than any other instrument in the open air, but this was simply because the effect of the natural wind would be almost exactly counterbalanced on opposite sides of the whirl. In portions of the whirl where the wind would tend to accelerate the motion, the much more rapid whirler motion would tend to keep the vane normal to the arm; and, even if the vane had any influence, it would tend to turn the anemometer at an angle with the arm in such a way as to make it lose the proper speed which it would have in its normal position.

It seems probable that the anemometer problem has nearly reached its solution. What are now needed most of all are experiments with an anemometer, as light as practicable, and which will present a slightly greater proportional resistance to the higher winds than to the lighter, and possibly cause fewer whirls around the cups.

H. A. HAZEN.

Washington, April 11.

Supposed Aboriginal Fish-Weirs in Naaman's Creek, near Claymont, Del.

THE copy of my letter published by the Rev. Mr. Peet in Vol. XII. of the *American Antiquarian*, March, 1890, No. 2, is correct in some respects, and incorrect in others. So far, Mr. Peet has failed to prove that I ever used the word "pile-dwellings," or "river-dwellings." My denial is quite as good as his assertion in this respect, until the original letter be produced, and proven to be mine. I have already given a true version of this letter in a former communication to *Science*, and sufficient reasons for the use of the terms "pile-structures," "pile-ends" or "log-ends," and "stations." They are sufficiently clear explanations for any one to understand without danger of an erroneous impression. No repetition of this explanation is therefore necessary. I call Mr. Peet's particular attention to this assertion.

In the reproduction of my letter, published on p. 118, *American Antiquarian*, March, 1890, I desire to correct the following error: "The numerous suggestions that the pile-structures were fish-weirs is untenable," should read "the numerous suggestions that the pile-structures were fish-weirs is tenable;" and if my



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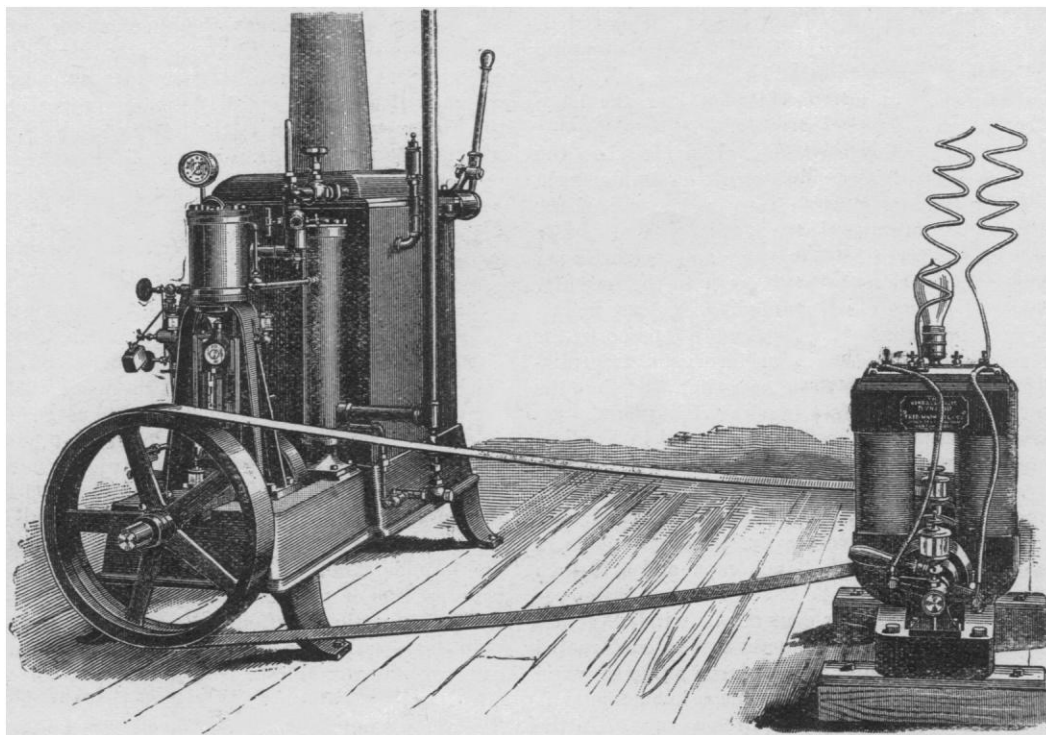
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letter in Mr. Peet's possession gives any other sense, it has been tampered with by some one desiring to make mischief. The remarks that I make at the end of this letter (written several years ago, and now for the first time published by Mr. Peet) show that I was opposed to theorizing upon the subject, and used the term "pile-structures" throughout the letter. Reasons for use of these terms, let me repeat have been referred to, as above stated. In regard to the quotations from the Peabody Museum

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reports, I have to say that its editor was perfectly free to express his opinions upon the subject, whether he accepted my fish-weir theory or not. So far, I have not yet made any definite report upon the subject, from lack of time to work the material up. There is no manuscript in the hands of the Peabody Museum, upon pile-dwellings or river-dwellings in North America, awaiting publication, as has been asserted. HILBORNE T. CRESSON.

Philadelphia, April 11.

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